force and elasticity; (3) those which are called vitaliferous, because they have regained their expansive force, and are thus capable of autonomous movements necessary to resist the compressions of the ether and to oppose the inertia of matter. They thus answer to the cell-souls of Haeckel. Ω.

DIE BEWEGUNG DER LEBENDIGEN SUBSTANZ. Eine vergleichend-physiologische Untersuchung der Contractionserscheinungen. By *Max Verworn*, Dr. med., Privatdocent der Physiologie an der Universität Jena. Mit 19 Abbildungen. Jena: Gustav Fischer, 1892.

The mechanism of muscle contraction and expansion and the motions of amœboid substance have been recognised as one and the same problem ; and several naturalists, foremost among them Hofmeister, Engelmann, and Edmund Montgomery have investigated it, fully aware of the enormous importance of the subject. The present pamphlet is small, it contains only 103 pages, but it contains the statement of the problem, a description of the author's experiments, and his solution so lucidly that one cannot read it without great satisfaction. Both processes, expansion as well as contraction, are, according to Verworn, spontaneous motions, and both are to be explained by chemotropy. Expansion, i. e., in amœba the protrusion of pseudopodia, is due to the plasma's hunger for the oxygen, which is contained in the surrounding medium. Every irritation (electric shocks, concussions, injuries etc.) causes a chemical decomposition of the oxygenised plasma ; it loses carbon, hydrogen, oxygen, and nitrogen, (as we know from the waste products, carbonic acid, creatine, lactic acid,) and these substances are exactly those which are most prominent in building up living substance. Irritations without exception cause the plasma to return to the nucleus. The chemical change in the plasma makes it hungry for the nuclear substances. The vital process, accordingly, is an interaction between the nucleus, the plasma, and the medium, so that in the constant exchange of materials the old structure is preserved ; and the fundamental features of the vital process are first the plasma's chemotropy for oxygen, causing centrifugal motions, and then its chemotropy for nuclear substance, causing centripetal motions. The plasma saturated with nuclear substances, shows a chemotropy for the oxygen of the medium ; it moves in a centrifugal direction, and the oxygenised plasma has become so unstable that it breaks down on the slightest provocation. The decomposed plasma exhibits a chemotropy for nuclear substance and thus returns in contripetal motions to the centre. Without entering into details we may mention that this accounts also for the fact that dying protoplasm always assumes a globular shape, until it crumbles to pieces. The *rigor mortis* is the last vital action of living substance. The plasma seeks once more the nuclear substance, but not finding sufficient material for being built up again into a substance endowed with a chemotropy for oxygen remains rigid until it decays.

The author finds his theory to hold good for the actions of the striated and

nonstriated muscles, and also of ciliated tissues. Having shown that the vital functions are due to the same forces that are observable in the retort of the chemist, he adds: "The savage accordingly was not quite wrong when he drew no distinct line, considering everything moving as alive. Life is motion. That old poetical view of all nature being animated with life throughout was in possession of a germ of truth, and our proud civilisation has actually made a retrogressive step in abandoning this view." *κρς.*

GRABER'S LEITFADEN DER ZOOLOGIE FÜR DIE OBEREN CLASSEN DER MITTELSCHULEN. Vienna and Prague: F. Tempsky. 1892. Price 1 fl. 60 kr.

We had occasion in a recent number of *The Monist* to review an excellent textbook of physics published by this same house. The present work on zoology is in its second edition, and is intended, like the above-mentioned work of Professor Mach's, for high-school instruction. Professor Graber, its author, died before the completion of the second edition, and the work was finished by J. Mik.

Graber's Zoology is unique in its class; it covers, within the restricted limits of two hundred and sixty-one pages, the whole field of elementary biology, human physiology, and zoology, as it is usually exploited in such books, and thus combines in a single volume what is usually contained in two or three. The human organism (Part 1) is made the starting-point of study in the work, and the explication of the physiological and mechanical functions of animals are thus all grouped about this central figure. In a concise form (55 pages) this book contains about all of human anatomy and physiology that is usually learned in high-schools. Part 1 also contains, at the end of the discussions, brief dietetic suggestions. "Systematic Zoology" is taken up in the Second Part. This part is well analysed and arranged. The cuts are also excellent. Attached to the book is a "Picture-Atlas." This atlas contains a number of colored plates, which depict various physiological and anatomical organs, and also four beautiful representations of scenes from the Naples Aquarium. Although this book will not be used by English school-students, it may be recommended to students of scientific German who wish a good introduction into the technical vocabulary of German biology and zoology, which to the foreigner is very difficult. *μκρκ.*

L'ANTHROPOLOGIE DU BENGALE. By *Paul Topinard.* Extracted from *L'Anthropologie* for May–June, 1892. Paris: G. Masson.

The present contribution to the science of Anthropology by the Editor of *L'Anthropologie*, is based on the anthropometric inquiries of Mr. H. H. Risley made under instructions from the government of Bengal. The conclusions deduced by Dr. Topinard from the large mass of material brought together by Mr. Risley, and which relates to members of all the castes to be met with in Bengal, are of great interest. He finds that the populations are much mixed, but that they may be divided into three types, one tall and dolichocephalic, that of the Aryans; another short and